IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Applicant | : Niranjan Damera-Venkata | Art Unit | : 2625 |
| Serial No. | : 10/698,899 | Examiner | : Kau, Steven Y |
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| Title | : EMBEDDING INFORMATION IN IMAGES | | |

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

# APPEAL BRIEF

## I. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, L.P., a Texas Limited Partnership having its principal place of business in Houston, Texas.

## II. Related Appeals and Interferences

Appellant is not aware of any related appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

## III. Status of Claims

Claims 1-38, which are the subject of this appeal, are pending.

Claims 1-38 stand rejected.

Appellant appeals all rejections of the pending claims 1-38.

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## IV. Status of Amendments

The amendments filed December 21, 2007, have been entered and acted upon by the Examiner.

No amendments were filed after the final Office action dated April 9, 2008.

## V. Summary of Claimed Subject Matter

### A. Independent claim 1

The aspect of the invention defined in independent claim 1 is a method of processing a contone image (FIG. 2A, image 200; ¶ 23). In accordance with this method, a bi-level bitmap of bits (FIG. 3, halftone bit map 310; ¶ 26) is determined from a graylevel value (FIG. 3, gray level 300; ¶ 26), wherein each of the bits has a respective one of either a first value or a second value (¶ 26, lines 1-3). The contone image is partitioned into an array of contone image blocks (¶ 29, lines 1-2; FIG. 3, image partitioner 315). A sequence of graphical code word symbols encoding information is generated (¶ 31, lines 1-2; FIG. 3, code word source 360). Blocks of an output halftone image (FIG. 3, halftone image 390; ¶ 35, last two lines) are produced from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap (¶¶ 31, 36, 42), wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks (¶ 31; ¶ 42, lines 1-4) and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols (¶ 31; ¶ 42, lines 1-6).

### B. Dependent claim 7

Claim 7 depends from claim 1 and recites that the producing comprises halftoning the contone image blocks (¶¶ 25, 30; FIG. 3, block 340), and determining whether to derive ones of the output halftone image blocks from either respective ones of the contone image blocks or respective ones of the graphical code word symbols based on image intensity levels in the respective ones of the contone image blocks (¶ 33).

C. Dependent claim 8

Claim 8 depends from claim 7 and recites that the halftoning comprises error diffusion halftoning the contone image blocks (¶ 34; FIG. 3, blocks 380, 320).

D. Dependent claim 9

Claim 9 depends from claim 1 and recites that the method further comprises diffusing error values determined from the output halftone image blocks (¶ 34; FIG. 3, blocks 380, 320).

E. Independent claim 12

The aspect of the invention defined in independent claim 12 is a method of extracting information embedded in a halftone image (FIG. 4, input 250). In accordance with this method, a bi-level bit map is accessed (FIG. 4, bitmap 450; ¶ 40). The halftone image is partitioned into a plurality of image blocks (¶ 41, lines 2-3). The bitmap is used to select at least some of the blocks (¶ 41, lines 1-2; ¶ 42; FIG. 4, block 430). A code word sequence is identified in the selected blocks (¶ 43; FIG. 4, block 440, 480). The information is extracted from the code word sequence (¶ 43; FIG. 4, block 270).

F. Independent claim 21

The aspect of the invention defined in independent claim 21 is an apparatus (FIG. 1, computer system 100; ¶ 17) comprising one of an encoder (FIG. 2A, block 220; ¶ 23) for encoding a contone image (FIG. 2A, image 200; ¶ 23) and a decoder (FIG. 2B; block 260; ¶ 24) for decoding a halftone image (FIG. 2B, input 250).

The encoder is operable to perform operations comprising the following operations. The encoder determines a first bi-level bitmap of bits (FIG. 3, halftone bit map 310; ¶ 26) from a graylevel value (FIG. 3, gray level 300; ¶ 26), wherein each of the bits has a respective one of either a first value or a second value (¶ 26, lines 1-3). The encoder partitions the contone image into an array of contone image blocks (¶ 29, lines 1-2; FIG. 3, image partitioner 315). The encoder generates a first sequence of graphical code word symbols encoding information (¶ 31, lines 1-2; FIG. 3, code word source 360). The encoder produces blocks of an output halftone image (FIG. 3, halftone image 390; ¶ 35, last two lines)

from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap (¶¶ 31, 36, 42), wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks (¶ 31; ¶ 42, lines 1-4) and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols (¶ 31; ¶ 42, lines 1-6).

The decoder is operable to perform operations comprising the following operations. The decoder determines a second bi-level bit map of bits (FIG. 4, bitmap 450; ¶ 40) from a graylevel value, wherein each of the bits of the second bi-level bit map has a respective one of two different values (FIG. 4, gray level 460; ¶ 40). The decoder partitions a version of the output halftone image into a plurality of partitioned halftone image blocks (¶ 41, lines 2-3). The decoder selects ones of the partitioned halftone image blocks in accordance with the values of respective ones of the bits of the second bitmap (¶ 41, lines 1-2; ¶ 42; FIG. 4, block 430). The decoder identifies a second sequence of graphical code word symbols from the selected ones of the partitioned halftone image blocks (¶ 43; FIG. 4, block 440, 480). The decoder extracts information from the second sequence of graphical code word symbols (¶ 43; FIG. 4, block 270).

G. Independent claim 29

The aspect of the invention defined in independent claim 29 is a computer-readable medium (FIG. 5, memories 514, 518) storing computer-readable instructions (FIG. 5, program 516; ¶ 44) for causing a computer to perform operations comprising the following operations. The computer-readable instructions cause the computer to determine a bi-level bitmap of bits (FIG. 3, halftone bit map 310; ¶ 26) from a graylevel value (FIG. 3, gray level 300; ¶ 26), wherein each of the bits has a respective one of either a first value or a second value (¶ 26, lines 1-3). The computer-readable instructions cause the computer to partition the contone image into an array of contone image blocks (¶ 29, lines 1-2; FIG. 3, image partitioner 315). The computer-readable instructions cause the computer to generate a sequence of graphical code word symbols encoding information (¶ 31, lines 1-2; FIG. 3, code word source 360). The computer-readable instructions cause the computer to produce blocks of an output halftone image (FIG. 3, halftone image 390; ¶ 35, last two lines) from ones of

the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap (¶¶ 31, 36, 42), wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks (¶ 31; ¶ 42, lines 1-4) and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols (¶ 31; ¶ 42, lines 1-6).

H. Independent claim 35

The aspect of the invention defined in independent claim 35 is a computer-readable medium (FIG. 5, memories 514, 518) storing computer -readable instructions (FIG. 5, program 516; ¶ 44) for causing a computer to perform operations comprising the following operations. The computer-readable instructions cause the computer to determine a bi-level bit map of bits (FIG. 4, bitmap 450; ¶ 40) from a graylevel value, wherein each of the bits has a respective one of two different values (FIG. 4, gray level 460; ¶ 40). The computer-readable instructions cause the computer to partition a halftone image into a plurality of partitioned halftone image blocks (¶ 41, lines 2-3). The computer-readable instructions cause the computer to select ones of the partitioned halftone image blocks in accordance with the values of respective ones of the bits of the bitmap (¶ 41, lines 1-2; ¶ 42; FIG. 4, block 430). The computer-readable instructions cause the computer to identifying a sequence of graphical code word symbols from the selected ones of the partitioned halftone image blocks (¶ 43; FIG. 4, block 440, 480). The computer-readable instructions cause the computer to extracting information from the sequence of graphical code word symbols (¶ 43; FIG. 4, block 270).

## VI. Grounds of Rejection to be Reviewed on Appeal

A. Claims 1-11 and 21-28 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

B. Claims 1-11, 18, 28, and 38 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

C. Claims 1-7, 10, 11, and 29-34 stand rejection under 35 U.S.C. § 103(a) over Curry (U.S. 5,710,636) in view of Tai (U.S. 7,218,420) and Wang (U.S. 5,337,361).

D. Claims 8 and 9 stand rejection under 35 U.S.C. § 103(a) over Curry (U.S. 5,710,636) in view of Tai (U.S. 7,218,420), Wang (U.S. 5,337,361), and Lapstun (U.S. 6,512,596).

E. Claims 12-20 and 35-38 stand rejection under 35 U.S.C. § 103(a) over Wang (U.S. 6,252,971) in view of Curry (U.S. 5,710,636) and Wang (U.S. 5,337,361).

## VII. Argument

### A. Claim rejections under 35 U.S.C. § 112, first paragraph

The Examiner has rejected claims 1-11 and 21-28 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

#### 1. Claims 1-11

##### a. Claim 1

Regarding claim 1, the Examiner has stated that (see § 4 on page 3 of the final Office action):

> With respect to claim 1, limitation recites, "wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the bits having the second value are derived from respective ones of the graphical code word symbols" (emphasis added by applicant), in which the underlined limitations are not disclosed in the original specification. There is no hardware or software or mathematical derivation support found in the original disclosure for deriving value from "respective ones of the contone image block" and "from ones of the graphical code word symbols".

In accordance with MPEP § 2163.II.A.3(b):

> The examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not recognize in the original disclosure a description of the invention defined by the claims.

In this regard, the Examiner merely has asserted that certain elements of claim 1 "are not disclosed in the original specification" and that there is "no hardware or software or

mathematical derivation support found in the original disclosure" for those elements. Such an assertion, by itself, does not constitute an explanation of "why persons skilled in the art would not recognize in the original disclosure a description of the invention defined by the claims." At the very least, the Examiner is obligated to explain why persons skilled in the art would not recognize a description of the allegedly unsupported elements in ¶¶ 30, 31, 33, 36, and 42 and FIG. 3 of the original disclosure.

For at least this reason, the rejection of independent claim 1 under 35 U.S.C. § 112, first paragraph, should be withdrawn.

Moreover, contrary to the Examiner's position, the subject matter of claim 1 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. In particular, the specification describes the allegedly unsupported subject matter of claim 1 as follows (emphasis added):

- ¶ 31 discloses that: "The code word sequence generator 360 utilizes the incoming data to produce graphical symbols which correspond to the code words. At logic stage 350, when a bit from halftone bitmap 310 corresponding to the spatial location of halftone image data o(m) is b(m)=1, then a symbol corresponding to a code word is generated and the output is set to that symbol."
- ¶ 33 discloses that: "In one embodiment, logic stage 350 may also contain additional logic that causes the test of b(m) to be skipped when the input block x(m) meets certain requirements, such as meeting certain minimum or maximum intensity thresholds, whereby the modified input image block is passed through to the output of logic stage 350."
- ¶ 42 discloses that: "In code word extraction stage 430, each relative bit of binary bitmap 450 is tested to see if it is a data indicator bit (e.g. value of 1) or an image indicator bit (e.g. value of 0). If it is an image indicator bit, the related sub-matrix of the aligned and corrected input image 250 is ignored or used to reconstruct the image (431); if it is a data indicator bit, then the image sub-matrix is passed to probabilistic analysis stage 440. In one embodiment, code word extraction stage 430 may also contain additional logic that causes the test of b(m) from bitmap 450 to be skipped when the input block meets certain requirements, such as meeting certain minimum or maximum intensity thresholds, whereby the modified input image block is simply ignored as it is known to not be a data block."

Thus, specification explicitly discloses that if the halftone bitmap bit has a value of 1 (i.e., b(m)=1), the bit is a data indicator bit and the corresponding block of the halftone image

390 is set to one of the code word symbols (see ¶ 31, ¶ 42, and FIG. 3); if the halftone bitmap bit has a value of 0 (i.e., b(m)=0), the bit is an image indicator bit and the corresponding block of the halftone image 390 is set to the value of the quantized halftone image blocks o(m) (see ¶ 30, ¶ 42, and FIG. 3). The specification also explicitly discloses that if certain minimum or maximum intensity thresholds are met, then the corresponding block of the halftone image 390 is set to the value of the quantized halftone image blocks o(m) (see ¶ 33 and ¶ 42, last sentence).

One skilled in the art at the time the application was filed would have understood from these explicit teachings that blocks of the output halftone image 390 are produced from ones of the contone image blocks x(m) and ones of the graphical code word symbols 360 in accordance with the values of respective ones of the bits of the bi-level bitmap 310, wherein ones of the output halftone image blocks associated with respective ones of the bits 310 having a value of 0 (or that correspond to image blocks meeting certain intensity thresholds) are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits 310 having a value of 1 are derived from respective ones of the graphical code word symbols 360.

Thus, the subject matter of claim 1 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. Therefore, the rejection of independent claim 1 under 35 U.S.C. § 112, first paragraph, should be withdrawn for at least this additional reason.

b. Claims 2-11

The Examiner has rejected claims 2-11 for the same reasons given in connection with the rejection of claim 1 (see § 4 on page 4 of the final Office action).

As explained above, the subject matter of claim 1 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. Therefore, the rejection of claims 2-11 under 35 U.S.C. § 112, first paragraph, should be withdrawn for at least the same reasons explained above in connection with claim 1.

Regarding claim 3, the Examiner has stated that (see § 4 on page 3 of the final Office action):

> Regarding claim 3, recites, "wherein the determining comprises producing the bitmap by halftoning a contone patch of the graylevel ~~is determined by the coding rate~~ value" (emphasis added by applicant), in which "contone patch" is not disclosed in the original specification.

Contrary to the Examiner's statement, however, "contone patch" is disclosed in ¶ 13. The term "contone patch" also is disclosed in each of claims 2, 22, and 30, as originally filed.

In addition, ¶ 13 explicitly explains that in some embodiments the bit map is produced by halftoning a constant patch of a graylevel.

Thus, the subject matter of claim 3 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. For at least these reasons, the rejection of independent claim 3 under 35 U.S.C. § 112, first paragraph, should be withdrawn for at least this reason.

2. Claims 21-28

a. Claim 21

Regarding claim 21, the Examiner has stated that (see § 4 on page 4 of the final Office action):

> Regarding Claim 21, limitation recites, "identifying a second sequence of graphical code word ~~sequence~~ symbols ~~in~~ from the selected ones of the partitioned halftone image ~~second~~ blocks, and extracting ~~the~~ information from the second sequence of graphical code word ~~sequence~~ symbols" (emphasis added by applicant). "second sequence of graphical code word" is not disclosed in the original specification. This is a new feature introduced in the amended claim.

Contrary to the Examiner's assertion, the original specification clearly discloses first and second sequences of graphical code words. In particular, the original specification discloses that a first sequence of graphical code words (corresponds to the sequence of code words generated by the selection logic 350 from the code word source 360 in accordance with the bits of the bit map 310) is embedded into the halftone image 390 (see, e.g., ¶ 31). The original specification also discloses that a second sequence of graphical code words (corresponding to the output of the probabilistic analysis and the code word decoding stages 440, 480) is identified from the ones of the aligned and geometrically corrected sub-matrices

of the input image 250 that as associated with bits of the bit map 450 that have a value of 1 (see ¶¶ 42, 43).

Thus, the subject matter of claim 21 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. For at least these reasons, the rejection of independent claim 21 under 35 U.S.C. § 112, first paragraph, should be withdrawn.

Claim 21 has not been rejected for any basis other than under 35 U.S.C. § 112, first paragraph. Therefore, claim 21 should be allowed.

b. Claims 22-28

The Examiner has rejected claims 22-28 for the same reasons given in connection with the rejection of claim 21 (see § 4 on page 4 of the final Office action).

As explained above, the subject matter of claim 21 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. Therefore, the rejection of claims 22-28 under 35 U.S.C. § 112, first paragraph, should be withdrawn for at least the same reasons explained above in connection with claim 21.

Claims 22-27 have not been rejected for any reason other than under 35 U.S.C. § 112, first paragraph.

**B. Claim rejections under 35 U.S.C. § 112, second paragraph**

Claims 1-11, 18, 28, and 38 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding the compliance of claims with 35 U.S.C. § 112, second paragraph, MPEP § 2173.02 explains that (citations omitted; original emphasis):

> The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:
>
> (A) The content of the particular application disclosure;

> (B) The teachings of the prior art; and
>
> (C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.
>
> In reviewing a claim for compliance with 35 U.S.C. 112, second paragraph, the examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill in the art of its scope and, therefore, serves the notice function required by 35 U.S.C. 112, second paragraph, by providing clear warning to others as to what constitutes infringement of the patent.
>
> If the language of the claim is such that a person of ordinary skill in the art could not interpret the metes and bounds of the claim so as to understand how to avoid infringement, a rejection of the claim under 35 U.S.C. 112, second paragraph, would be appropriate. However, if the language used by applicant satisfies the statutory requirements of 35 U.S.C. 112, second paragraph, but the examiner merely wants the applicant to improve the clarity or precision of the language used, the claim must <u>not</u> be rejected under 35 U.S.C. 112, second paragraph, rather, the examiner should suggest improved language to the applicant.

The Examiner is obligated to establish a proper *prima facie* case of indefiniteness under 35 U.S.C. § 112, second paragraph. In this regard, the Board has stated that (emphasis added):

> In rejecting a claim under the second paragraph of 35 U.S.C. 112, <u>it is incumbent on the examiner to establish</u> that one of ordinary skill in the pertinent art, when reading the claims in light of the supporting specification, would not have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims.[1]

Similarly, MPEP § 2173.02 explains that (emphasis added):

> If upon review of a claim in its entirety, the examiner concludes that a rejection under 35 U.S.C. 112, second paragraph, is appropriate, such a rejection should be made and <u>an analysis as</u>

[1] *Ex parte* Wu, 10 USPQ 2d 2031, 2033 (B.P.A.I. 1989) (emphasis added) (citing *In re* Moore, 439 F.2d 1232, 169 USPQ 236 (C.C.P.A. 1971)

to why the phrase(s) used in the claim is "vague and indefinite" should be included in the Office action.

1. Claims 1-11

The sole basis given in support of the rejection of claims 1-11 under 35 U.S.C. § 112, second paragraph, is the assertion that "Applicant failed to particularly point out how and in what extent the derivation of values from 'contone image block' and 'graphical code word' discussed in the claim rejection under 35 U.S.C. 112 first paragraph" (see § 6 on page 4 of the final Office action).

In this rationale, the Examiner appears to have improperly conflated his rejection of claims 1-11 under 35 U.S.C. § 112, first paragraph, with a rejection under 35 U.S.C. § 112, second paragraph.

Nevertheless, the mere assertion that "Applicant failed to particularly point out how and in what extent the derivation of values from 'contone image block' and 'graphical code word' does not constitute an explanation why one of ordinary skill in the pertinent art, when reading the claims in light of the supporting specification and the prior art, would not have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims 1-11. Thus, the Examiner has not established a *prima facie* case of indefiniteness and therefore the rejection of claims 1-11 under 35 U.S.C. § 112, second paragraph, should be withdrawn for at least this reason.

In addition, one of ordinary skill in the pertinent art, when reading claims 1-11 in light of the supporting specification would have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims. Indeed, the Examiner himself appears to have understood the scope of claims 1-11; the Examiner's rejection of these claims under 35 U.S.C. § 112, second paragraph, appears to be based only his apparent inability to find the support for certain language of claim 1 in the original disclosure. As explained above in connection with the rejection of claim 1 under 35 U.S.C. § 112, first paragraph, however, the original disclosure does in fact disclose the subject matter of claim 1 in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. This explanation also includes a showing of the original specification discloses a contone image processing method that involves producing blocks of an output halftone image

in which "ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols," as recited in claim 1.

For at least these reasons, the rejection of claims 1-11 under 35 U.S.C. § 112, second paragraph, should be withdrawn.

2. Claims 18, 28, and 38

The sole basis given by the Examiner in support of the rejection of claims 18, 28, and 38 under 35 U.S.C. § 112, second paragraph, is as follows (see § 6 on page 5 of the final Office action):

> Claim 18, 28 and 38, limitation recites, "using the set of probability parameters to select the most a likely sequence of graphical code word symbols" in which applicant failed to particularly point out whether "the set of probability parameters to select a sequence of graphical code word symbols". "likely" used in the claim language is an uncertain word.

Contrary to the Examiner's assertion, claims 18, 28, and 38 are definite. The adjective "likely" means "having a high probability of occurring or being true : very probably" (see Merriam-Webster's Collegiate Dictionary - Tenth Edition (1995)). One of ordinary skill in the pertinent art, when reading claims 18, 28, and 38 in light of the supporting specification (see, e.g., ¶ 43) would have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims. In particular, such a person would have been able to ascertain that a likely sequence of graphical code word symbols is a graphical code word symbol sequence that has a high probability of being the actual code word sequence that was encoded into the halftone image.

For at least these reasons, the rejection of claims 18, 28, and 38 under 35 U.S.C. § 112, second paragraph, should be withdrawn.

## C. Rejections of claims 1-7, 10, 11, and 29-34 under 35 U.S.C. § 103(a)

1. Applicable standards for sustaining a rejection under 35 U.S.C. § 103(a)

"A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. §103(a).

In an appeal involving a rejection under 35 U.S.C. § 103, an examiner bears the initial burden of establishing *prima facie* obviousness. See In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). To support a *prima facie* conclusion of obviousness, the prior art must disclose or suggest all the limitations of the claimed invention.[2] See In re Lowry, 32 F.3d 1579, 1582, 32 USPQ2d 1 031, 1034 (Fed. Cir. 1994). If the examiner has established a *prima facie* case of obviousness, the burden of going forward then shifts to the applicant to overcome the *prima facie* case with argument and/or evidence. Obviousness, is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. This inquiry requires (a) determining the scope and contents of the prior art; (b) ascertaining the differences between the prior art and the claims in issue; (c) resolving the level of ordinary skill in the pertinent art; and (d) evaluating evidence of secondary consideration. See KSR Int'l Co. v. Teleflex Inc., No. 127 S. Ct. 1727, 1728 (2007) (citing Graham v. John Deere, 383 U.S. I, 17-18, 148 USPQ 459, 467 (1966)). If all claim limitations are found in a number of prior art references, the fact finder must determine whether there was an apparent reason to combine the known elements in the fashion claimed. See KSR, 1741. This analysis should be made explicit. KSR at 1741 (citing In re Kahn, 441 F. 3d 977, 988 (Fed. Cir. 2006): "[R]ejections on obviousness grounds cannot be sustained

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[2] The U.S. Patent and Trademark Office has set forth the following definition of the requirements for establishing a *prima facie* case of unpatentability (37 CFR § 1.56(b)(ii):

> A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness").

2. Claims 1-7, 10, 11, and 29-34

Claims 1-7, 10, 11, and 29-34 stand rejection under 35 U.S.C. § 103(a) over Curry (U.S. 5,710,636) in view of Tai (U.S. 7,218,420) and Wang (U.S. 5,337,361).

a. Claim 1

(i) Introduction

Independent claim 1 recites:

> 1. A method of processing a contone image, the method comprising:
>
> determining a bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value;
>
> partitioning the contone image into an array of contone image blocks;
>
> generating a sequence of graphical code word symbols encoding information; and
>
> producing blocks of an output halftone image from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap, wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols.

The rejection of independent claim 1 under 35 U.S.C. § 103(a) over Curry in view of Tai and Wang should be withdrawn because Curry, Tai, and Wang, taken either alone or in any permissible combination, do not disclose or suggest all the elements of the claimed invention. The rejection of claim 1 also should be withdrawn because at the time the invention was made there was not any apparent reason to combine the teachings of Curry, Tai, and Wang in the manner proposed by the Examiner.

(ii) The Examiner's position

In support of the rejection of claim 1, the Examiner has taken the position that (see § 8 on pages 5-7 of the final Office action):

- Curry discloses the "producing" element of claim 1 in FIGS. 1 and 4-6, col. 2, lines 32-39, col. 3, lines 31-46, and col. 3, line 61-col. 4, line 5 (see § 8 on pages 5-6 of the final Office action;
- Tai discloses the "determining" element of claim 1 in col. 12, line 63 - col. 13, line 25;
- Tai discloses the "partitioning" element of claim 1 in FIGS. 6A-C and 21-1 - 21-5, col. 8, lines 6-16, and col. 10, lines 29-57; and
- Wang discloses the "generating" element of claim 1 in FIGS. 1 and 2, col. 2, lines 48-53, and col. 5, lines 29-57.

(iii) The cited references do not disclose or suggest all the elements of claim 1

(a) The cited references do not disclose or suggest the "producing" element of claim 1

The Examiner has taken the position that Curry discloses the first clause of the "producing" element of claim 1 in FIG. 1 and col. 2, lines 32-39 and col. 3, lines 31-46 (see § 8 on page 6 of the Office action). Contrary to the Examiner's position, however, the cited disclosure does not disclose the first clause of the "producing" element of claim 1. In particular, the cited disclosure contains the following teachings:

- In FIG. 1, Curry discloses an image generation system 8 that produces a halftone image from a set of halftone cells (shown in FIGS. 2A-2C), where the orientation of the halftone cells is controlled by the bit map codes (corresponding to the input pattern) output from the bitmap generator 10 and the tone of the halftone cells is controlled by the grayscale image data output from the image generator 12.
- In col. 2, lines 32-39, Curry discloses that the cells of the halftone image are produced based on the bitmap codes and the grayscale image data.
- In col. 3, lines 31-36, Curry enumerates the functional elements of the image generation system 8.

Thus, the cited disclosure does not show "producing blocks of an output halftone image from ones of the contone image blocks and ones of the graphical code word symbols in

accordance with the values of respective ones of the bits of the bi-level bitmap," as recited in claim 1. Instead, the cited disclosure shows a method of producing an output halftone image in which the output halftone image is formed exclusively formed from halftone cells that encode information in their respective rotational orientations. Thus, Curry fails to show that the output halftone image is formed from ones of the grayscale image data output by the image generator 12.

In accordance with the Examiner's rationale, Curry's disclosure that "The halftone cells are generated based on bitmap codes and on grayscale image data" (see col. 2, lines 36-38) would have led one skilled in the art to understand that "when a contone image block, or grayscale image data is embedded with bitmap codes, it must be data or bits of data from contone and bits of data from bitmap codes as shown in Fig. 1, & col. 2, lines 32-39 & col. 3, lines 31-46"(see § 8 on page 6 of the Office action). The Examiner's assumption, however, is contrary to Curry's express disclosure. In particular, Curry expressly discloses that all of the halftone cells from which the output halftone image is generated are composed of cells that encode information (i.e., graphical code word symbols) (see, e.g., col. 4, lines 1-32).

It is noted that the Examiner has misquoted the first clause of the "producing" element of claim 1 in the rationale given in support of the rejection of claim 1. In particular, the Examiner has stated that Curry discloses producing blocks of an output halftone image "from ones of the contone image blocks and ones of the bit map." The pertinent clause of claim 1, however, recites: "producing blocks of an output halftone image from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap." Thus, on its face, the Examiner has not shown that Curry discloses the subject matter defined in the first clause of the "producing" element of claim 1.

The Examiner also has taken the position that Curry discloses the second clause of the "producing" element of claim 1 in col. 3, lines 36-46 and col. , line 61 - col. 4, line 5 (see § 8 on page 6 of the Office action).

- In col. 3, lines 36-46, Curry discloses that the bitmap codes are generated by the bitmap generator 10 based upon a desired pattern to be embedded in the output halftone image.
- In col. 3, line 61 - col. 4, line 5, Curry discloses that the halftone generator 10 retrieves from a table halftone cells that are addressed by the grayscale image

sample values output by the image generator 12 and the bitmap codes output by the bitmap generator 10.

Thus, the cited disclosure does not disclose or suggest "wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols," as recited in the second clause of the "producing" element of claim 1. Instead, the cited disclosure teaches a method of producing an output halftone image in which the output halftone image is formed exclusively formed from halftone cells that encode information in their respective rotational orientations. For example, FIG. 3 clearly shows that the regions of the output halftone image that contain the human-readable pattern and the regions of the output halftone image that do not contain the human-readable pattern all are formed by halftone cells encoded with both ones and zeros.

The Examiner has not even attempted to show that Tai or Wang makes-up for the failure of Curry to disclose or suggest the "producing" element of independent claim 1. Thus, the cited references, taken either alone or in any permissible combination, do not disclose the "producing" element of claim 1. For at least this reason, the rejection of independent claim 1 under 35 U.S.C. § 103(a) over Curry in view of Tai and Wang should be withdrawn.

(b) The cited references do not disclose or suggest the "determining" element of claim 1

The Examiner has taken the position that Tai discloses the "determining" element of claim 1 in col. 12, line 63 - col. 13, line 25. Contrary to the Examiner's position, however, the cited disclosure of Tai does not disclose or suggest "determining a bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value," as recited in claim 1. To the contrary, the cited disclosure discloses a GRET processor 28 (see FIG. 12) that uses original bitmap data and gradient magnitude and gradient direction information to "select edge enhanced gray-scale output data to replace the binary bitmap data entering the GRET processor" (see col. 13, lines 14-21), where "'gray-scale'

refers to image data wherein each pixel is represented by more than one bit" (see col. 12, lines 41-44).

The Examiner has not even attempted to show that Curry or Wang makes-up for the failure of Tai to disclose or suggest the "determining" element of independent claim 1. Thus, the cited references, taken either alone or in any permissible combination, do not disclose the "determining" element of claim 1. For at least this additional reason, the rejection of independent claim 1 under 35 U.S.C. § 103(a) over Curry in view of Tai and Wang should be withdrawn.

(c) Conclusion

For the reasons explained above, the cited references do not disclose or suggest all the elements of claim 1 and therefore the rejection of claim 1 under 35 U.S.C. § 103(a) over Curry in view of Tai and Wang should be withdrawn.

(iv) There is no apparent reason to combine the teachings of the cited references in the manner proposed by the Examiner

As explained above, the Examiner is obligated to show that there was an apparent reason to combine the known elements in the fashion claimed. See KSR, 1741. The Examiner's analysis in this regard should be made explicit. KSR at 1741 (citing In re Kahn, 441 F. 3d 977, 988 (Fed. Cir. 2006): "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness").

The sole rationale given by the Examiner in support of his proposed combination of the teachings of the cited references is as follows (see § 8 on page 7 of the final Office action; emphasis added):

> Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Curry to include determining a bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value; partitioning the contone image into an array of contone image blocks taught by Tai to produce smoother image without jagged edges (col 13,lines 29-34), and then to have modified Curry together with Tai to include generating a sequence of graphical code word symbols encoding information taught by Wang to validate or authenticate the finished image.

The cited references, however, do not support the Examiner's proposed modification of Curry's system.

First, the Examiner has not given any explanation of the apparent reason one skilled in the art would have been led to modify Curry "to include determining a bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value." It is not surprising that the Examiner has failed to provide such a showing because such a modification would not have served any apparent useful purpose in the context of Curry's system. In particular, Curry's system produces a halftone image from a set of halftone cells (shown in FIGS. 2A-2C), where the orientation of the halftone cells is controlled by the bit map codes (corresponding to the input pattern) output from the bitmap generator 10 and the tone of the halftone cells is controlled by the grayscale image data output from the image generator 12. It would not have served any apparent useful purpose to determine the bit map codes "from a graylevel value" because the resulting bit map codes would no longer be "based upon a desired pattern to be encoded within the halftone image," in accordance with Curry's teachings (see col. 3, lines 42-43).

Second, the disclosure in col. 13, lines 29-34 of Tai does not support the Examiner's assertion that partitioning the grayscale image data disclosed in Curry into an array of contone image blocks produces smoother image without jagged edges. Instead, the cited disclosure teaches that replacing the binary input data from a threshold/detector with enhanced grayscale output produces a smoother image without jagged edges. One skilled in the art would not have had any apparent reason to make the Examiner's proposed modification of Curry because the grayscale image data disclosed in Curry does not constitute "binary data". In addition, is it unclear what the result of the Examiner's proposed modification of Curry's system would be since the output halftone image is produced solely of the preprogrammed halftone cells (see FIGS. 2A-2C) whose tone is controlled by the grayscale image data.

Third, Wang does not support the Examiner's assertion that modifying Curry's system to include generating a sequence of graphical code word symbols encoding information would validate or authenticate the finished image. Instead, Wang discloses that "It is therefore an object of this invention to provide a record with a graphic image along with encoded information to validate or authenticate the record" (col. 2, lines 13-15). This disclosure would not have given anyone any apparent reason to modify Curry's system as

proposed by the Examiner because it does not describe anything about a sequence of graphical code word symbols (a "graphic image" does not connote a sequence of graphical code word symbols).

Instead of pointing to some teaching or suggestion in Curry, Tai, Wang, or the knowledge generally available to support the proposed combination of Curry, Tai, and Wang, the Examiner has relied on circular reasoning. In particular, the Examiner's proffered motivation (i.e., because it would produce smoother image without jagged edges or allow validation or authentication of the finished image) assumes the result (i.e., the modification of Curry's system) to which the proffered "motivation" was supposed to have led one skilled in the art. Such circular reasoning cannot possibly support a rejection under 35 U.S.C. § 103(a). Indeed, such circular reasoning only evidences the fact that the Examiner improperly has engaged in impermissible hindsight reconstruction of the claimed invention, using applicants' disclosure as a blueprint for piecing together elements from the prior art in a manner that attempts to reconstruct the invention recited in claim 1 only with the benefit of impermissible hindsight (see KSR Int'l Co. v. Teleflex Inc., slip op. at 17: "A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning."). The fact is that none of the cited references nor the knowledge generally available at the time the invention was made would have led one skilled in the art to believe that there was any problem to be solved or any advantage that would be gained by the Examiner's proposed modification of Curry's system.

Without any apparent reason for modifying Curry's system, the Examiner's rationale in support of the rejection of claim 1 amounts to no more than a conclusory statement that cannot support a rejection under 35 U.S.C. § 103.

For at least these additional reasons, the rejection of claim 1 under 35 U.S.C. § 103(a) over Curry in view of Tai and Wang should be withdrawn.

b. Claims 2-7, 10 and 11

Each of claims 2-7, 10, and 11 incorporates the elements of independent claim 1 and therefore is patentable over Curry in view of Tai and Wang for at least the same reasons explained above.

Claim 7 also is patentable over Curry in view of Tai and Wang for the following additional reasons.

Claim 7 depends from claim 1 and recites that the producing comprises halftoning the contone image blocks, and determining whether to derive ones of the output halftone image blocks from either respective ones of the contone image blocks or respective ones of the graphical code word symbols based on image intensity levels in the respective ones of the contone image blocks.

The sole rationale given by the Examiner in support of the rejection of claim 7 is the following:

> Claim 7 recites identical features as claim 1. Thus, arguments similar to that presented above for claim 1 are also equally applicable to claim 7.

The rationale given by the Examiner in support of the rejection of claim 1, however, does not include any showing whatsoever that any of the cited references discloses or suggests and of: (i) "halftoning the contone image blocks"; and (ii) "determining whether to derive ones of the output halftone image blocks from either respective ones of the contone image blocks or respective ones of the graphical code word symbols based on image intensity levels in the respective ones of the contone image blocks."

Thus, the Examiner has failed to establish a *prima facie* case that claim 7 is obvious over the cited references. For at least this additional reason, the rejection of claim 7 under 35 U.S.C. § 103(a) over Curry in view of Tai and Wang should be withdrawn.

c. Claims 29-34

Independent claim 29 recites elements that essentially track the pertinent elements of independent claim 1 discussed above. Therefore, claim 29 is patentable over Curry in view of Tai and Wang for at least the same reasons explained above in connection with independent claim 1.

Each of claims 30-34 incorporates the elements of independent claim 29 and therefore is patentable over Curry in view of Tai and Wang for at least the same reasons.

Claim 34 also is patentable over Curry in view of Tai and Wang for the same additional reasons explained above in connection with claim 7.

**D. Rejections of claims 8 and 9 under 35 U.S.C. § 103(a)**

1. Introduction

Claims 8 and 9 stand rejection under 35 U.S.C. § 103(a) over Curry (U.S. 5,710,636) in view of Tai (U.S. 7,218,420), Wang (U.S. 5,337,361), and Lapstun (U.S. 6,512,596).

Each of claims 8 and 9 incorporates the elements of independent claim 1. Lapstun does not make-up for the failure of Curry, Tai, and Wang to disclose or suggest the elements of independent claim 1 discussed above. Therefore, claims 8 and 9 are patentable over Curry in view of Tai, Wang, and Lapstun for at least the same reasons explained above.

Claims 8 and 9 also are patentable over Curry in view of Tai, Wang, and Lapstun for the following additional reasons.

2. Claim 8

Claim 8 depends from claim 7 and recites that the halftoning comprises error diffusion halftoning the contone image blocks.

In support of the rejection of claim 8, the Examiner has stated that (see page 8 of the final Office action):

> Regarding claim 8.
>
> Curry does not teach error diffusion.
>
> Lapstun discloses a half toner/compositor, in that he teaches that the half toning is error diffusion half toning (col 18, lines 53-57).
>
> Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Curry to include the half toning is error diffusion half toning taught by Lapstun because it gives better result (col 18, lines 55-57).

In col. 18, lines 53-57, Lapstun teaches that "Because the printing is bi-level, the input image should be dithered or error-diffused for best results." This disclosure does not disclose or suggest anything whatsoever about error diffusion halftoning grayscale data that is fed into a halftone generator of the type disclosed in Curry, which halftone generator selects preprogrammed halftone cells from a lookup table based on the values of the grayscale data and bitmap codes. Therefore, one skilled in the art would not have had any apparent reason to combine the teachings of Curry and Lapstun in the manner proposed by the Examiner. To

the contrary, one skilled in the art would have not been motivated to combine the reference teachings in this way because the error diffusion halftoning would not have served any apparent useful purpose because the output of Curry's halftone generator would not be affected; in particular, the output would still be a series of preprogrammed halftone cells (see col. 4, lines 1-5).

For at least this additional reason, the rejection of claim 8 over Curry in view of Tai, Wang, and Lapstun should be withdrawn.

3. Claim 9

Claim 9 depends from claim 1 and recites that the method further comprises diffusing error values determined from the output halftone image blocks.

In support of the rejection of claim 9, the Examiner has stated that (see page 8 of the final Office action):

> Regarding claim 9.
>
> Curry does not teach that ~~wherein~~ further comprising diffusing error values determined from the output halftone image blocks.
>
> Lapstun teaches ~~wherein~~ further comprising diffusing error values determined from the output halftone image blocks {e.g. a dither volume provides great flexibility in dither cell} (col 37, lines 6-20).
>
> Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Curry to include ~~wherein~~ further comprising diffusing error values determined from the output halftone image blocks taught by Lapstun because it gives better result (col 18, lines 55-57).

In col. 18, lines 53-57, Lapstun discloses a multi-threshold dither volume for printing contone pixel values. This disclosure does not disclose or suggest anything whatsoever about error diffusion halftoning grayscale data that is fed into a halftone generator of the type disclosed in Curry, which halftone generator selects preprogrammed halftone cells from a lookup table based on the values of the grayscale data and bitmap codes. Therefore, one skilled in the art would not have had any apparent reason to combine the teachings of Curry and Lapstun in the manner proposed by the Examiner. To the contrary, one skilled in the art would have not been motivated to combine the reference teachings in this way because the error diffusion halftoning would not have served any apparent useful purpose because the output of Curry's halftone generator would not be affected; in particular, the output would still be a series of

preprogrammed halftone cells (see col. 4, lines 1-5). Moreover, in the context of Curry's halftone generator, there are no error values to diffuse.

For at least this additional reason, the rejection of claim 9 over Curry in view of Tai, Wang, and Lapstun should be withdrawn.

## E. Rejections of claims 12-20 and 35-38 under 35 U.S.C. § 103(a)

Claims 12-20 and 35-38 stand rejection under 35 U.S.C. § 103(a) over Wang (U.S. 6,252,971; hereinafter Wang '971) in view of Curry (U.S. 5,710,636) and Wang (U.S. 5,337,361; hereinafter Wang '361).

### 1. Claim 12

Independent claim 12 recites:

> 12. A method of extracting information embedded in a halftone image, the method comprising:
>
> accessing a bi-level bit map;
>
> partitioning the halftone image into a plurality of image blocks;
>
> using the bitmap to select at least some of the blocks;
>
> identifying a code word sequence in the selected blocks; and
>
> extracting the information from the code word sequence.

The rejection of independent claim 12 under 35 U.S.C. § 103(a) over Wang '971 in view of Curry and Wang '361 should be withdrawn because Wang '971, Curry, and Wang '361, taken either alone or in any permissible combination, do not disclose or suggest all the elements of the claimed invention.

In support of the rejection of claim 12, the Examiner has taken the position that (see § 10 on pages 5-7 of the final Office action):

- Wang '971 discloses the "accessing" element of claim 12 in col. 1, lines 61 - col. 2, line 4;
- Wang '971 discloses the "partitioning" element of claim 12 in FIG. 6 and col. 4, lines 1-28;

- Wang '971 discloses the "identifying" element of claim 12 in FIG. 11, col. 4, lines 29-44, and col. 7, lines 1-24;
- Wang '971 discloses the "extracting" element of claim 12 in FIG. 11 and col. 7, lines 1-24; and
- Curry discloses the "using" element in claim 12 in col. 2, lines 35-40 and col. 4, lines 1-5.
- (The Examiner has not relied on Wang '361 in support of the rejection of claim 12.)

Contrary to the Examiner's position, Wang '971 does not disclose or suggest any of the "partitioning", "identifying", and "extracting" elements of claim 12.

In accordance with the teachings of Wang '971, a watermark is embedded in an image by selecting cluster centers throughout an input image and embedding into the input image a sequence of predetermined tile patterns corresponding to individual characters or watermarks based on a modified halftoning process (see col. 6, lines 1-13 and 40-48, and FIGS. 9 and 10). The embedded watermark is detected and visualized by estimating the average amplitude and the angle of halftone frequency of the input image, generating a checkerboard reference pattern having the same halftone frequency and size of the input image, and overlapping the reference pattern with the input image (see col. 7, lines 25-39 and 56-65, and FIGS. 12 and 13).

Wang '971 does not disclose the "partitioning" element of the information extraction method of claim 12. In particular, the "partitioning" element recites "partitioning the halftone image into a plurality of image blocks," where information is embedded in the halftone image (see preamble of claim 12). In accordance with Wang '971, the input image containing embedded information is not partitioned into a plurality of image blocks. Instead, the input image analyzed to determine the average amplitude and the angle of halftone frequency of the input image a checkerboard reference pattern having the same halftone frequency and size of the input image is generated, and the reference pattern is overlapped with the input image (see col. 7, lines 25-39 and 56-65, and FIGS. 12 and 13).

Contrary to the Examiner's position, Wang '971 does not disclose the "partitioning" element of claim 12 in col. 4, lines 1-28; instead, Wang '971 discloses how a watermark is embedded in an input image, not how information is extracted from an input image.

Wang '971 does not disclose the "identifying" element of the information extraction method of claim 12. In particular, the "identifying" element recites "identifying a code word

sequence in the selected blocks," where the blocks are selected using a bi-level bitmap (see the "using" element of claim 12). As explained in the preceding paragraph, in the information extraction method disclosed in Wang '971 the input image containing embedded information is not partitioned into a plurality of image blocks. Since there are no blocks, Wang '971 cannot possibly disclose "identifying a code word sequence in the selected blocks." Instead, Wang '971 discloses that the input image analyzed to determine the average amplitude and the angle of halftone frequency of the input image a checkerboard reference pattern having the same halftone frequency and size of the input image is generated, and the reference pattern is overlapped with the input image (see col. 7, lines 25-39 and 56-65, and FIGS. 12 and 13).

Contrary to the Examiner's position, Wang '971 does not disclose the "identifying" element of claim 12 in col. 4, lines 29-44 (cited by the Examiner); instead, Wang '971 discloses how a watermark is embedded in an input image, not how information is extracted from an input image. Wang '971 also does not disclose the "identifying" element of claim 12 in col. 7, lines 1-24; instead, Wang '971 discloses that a watermark detector 760 locates cluster centers and compares surrounding tiles based on a cluster-to-cluster correlation. In this process, the embedded watermark is detected and visualized by estimating the average amplitude and the angle of halftone frequency of the input image, generating a checkerboard reference pattern having the same halftone frequency and size of the input image, and overlapping the reference pattern with the input image (see col. 7, lines 25-39 and 56-65, and FIGS. 12 and 13).

Wang '971 does not disclose the "extracting" element of the information extraction method of claim 12. In particular, the "extracting" element recites "extracting the information from the code word sequence," where the code word sequence is identified in the selected blocks (see the "using" and "identifying" elements of claim 12). As explained in the preceding paragraph, in the information extraction method disclosed in Wang '971 a code word sequence is not identified in the selected blocks. Since there are no blocks, Wang '971 cannot possibly disclose "identifying a code word sequence in the selected blocks." Instead, Wang '971 discloses that the input image analyzed to determine the average amplitude and the angle of halftone frequency of the input image a checkerboard reference pattern having the same halftone frequency and size of the input image is generated, and the reference

pattern is overlapped with the input image (see col. 7, lines 25-39 and 56-65, and FIGS. 12 and 13).

Contrary to the Examiner's position, Wang '971 does not disclose the "extracting" element of claim 12 in col. 7, lines 1-24; instead, Wang '971 discloses that a watermark detector 760 locates cluster centers and compares surrounding tiles based on a cluster-to-cluster correlation. In this process, the embedded watermark is detected and visualized by estimating the average amplitude and the angle of halftone frequency of the input image, generating a checkerboard reference pattern having the same halftone frequency and size of the input image, and overlapping the reference pattern with the input image (see col. 7, lines 25-39 and 56-65, and FIGS. 12 and 13).

For the reasons explained above, Wang '971 does not disclose or suggest any of the "partitioning", "identifying", and "extracting" elements of claim 12.

Furthermore, contrary to the Examiner's position, Curry does not disclose the "using" element in claim 12 in col. 2, lines 35-40 and col. 4, lines 1-5. In particular, the "using" element of claim 12 recites "using the bitmap to select at least some of the blocks," where the blocks are partitioned from a halftone image containing embedded information (see the "partitioning" element and the preamble of claim 12). In col. 2, lines 35-40, Curry discloses that a halftone image is formed from halftone cells that are generated based on bitmap codes and grayscale image data. This disclosure describes a process of encoding information into a halftone image, not extracting information embedded in a halftone image. In col. 4, lines 1-5, Curry discloses that the halftone generator 10 retrieves from a table halftone cells that are addressed by the grayscale image sample values output by the image generator 12 and the bitmap codes output by the bitmap generator 10. This disclosure also describes a process of encoding information into a halftone image, not extracting information embedded in a halftone image.

The only disclosure Curry provides regarding the way in which information is extracted from the output halftone images produced by his method is as follows (col. 4, lines 63-66):

> ... As explained above, the encoded data value is based on rotation of the halftone cells relative to one another. The encoded data is typically read by a machine. Devices such as input scanners can be employed for recovering machine readable encoded data from the image....

This disclosure implies that the output halftone images produced by Curry's method are read by determining the rotational orientations of the halftone cells that make up the output halftone image. Such a process would not involve using a bi-level bitmap to select at least some of the blocks partitioned from a halftone image containing embedded information. Indeed, as explained above in connection with independent claim 1, each of the output halftone image blocks is encoded with either a "1" or a "0" in order to produce the human-readable patter (see col. 4, lines 57-59; also see FIG. 3). In this case, using the bitmap to select at least some of the blocks would not serve any apparent useful purpose.

Thus, the cited references, taken either alone or in any permissible combination, do not disclose or suggest any of the "partitioning", "using", "identifying", and "extracting" elements of claim 12. For at least this reason, the rejection of claim 12 under 35 U.S.C. § 103(a) over Wang '971 in view of Curry and Wang '361 should be withdrawn.

2. Claims 13-20

Each of claims 13-20 incorporates the elements of independent claim 12 and therefore is patentable over Wang '971 in view of Curry and Wang '361 for at least the same reasons explained above.

3. Claims 35-38

Independent claim 35 recites:

> 35. A computer-readable medium storing computer-readable instructions for causing a computer to perform operations comprising:
>
> determining a bi-level bit map of bits from a graylevel value, wherein each of the bits has a respective one of two different values;
>
> partitioning a halftone image into a plurality of partitioned halftone image blocks;
>
> selecting ones of the partitioned halftone image blocks in accordance with the values of respective ones of the bits of the bitmap;
>
> identifying a sequence of graphical code word symbols from the selected ones of the partitioned halftone image blocks; and

extracting information from the sequence of graphical code word symbols.

Independent claim 35 recites elements that essentially track the pertinent elements of independent claim 12 discussed above. Therefore, claim 35 is patentable over Wang '971 in view of Curry and Wang '361 for at least the same reasons explained above in connection with independent claim 12.

Each of claims 36-38 incorporates the elements of independent claim 35 and therefore is patentable over Wang '971 in view of Curry and Wang '361 for at least the same reasons.

## VIII. Conclusion

For the reasons explained above, all of the pending claims are now in condition for allowance and should be allowed.

Charge any excess fees or apply any credits to Deposit Account No. 08-2025.

Respectfully submitted,

Date: September 9, 2008

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## CLAIMS APPENDIX

The claims that are the subject of Appeal are presented below.

Claim 1 (previously presented): A method of processing a contone image, the method comprising:

determining a bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value;

partitioning the contone image into an array of contone image blocks;

generating a sequence of graphical code word symbols encoding information; and

producing blocks of an output halftone image from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap, wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols.

Claim 2 (previously presented): The method of claim 1, wherein the determining comprises determining the bitmap based on the graylevel value.

Claim 3 (previously presented): The method of claim 2, wherein the determining comprises producing the bitmap by halftoning a contone patch of the graylevel value.

Claim 4 (previously presented): The method of claim 1, wherein the determining comprises selecting the bitmap from a set of bi-level bitmaps.

Claim 5 (previously presented): The method of claim 1, wherein the producing comprises producing the output halftone image blocks with a dimension that is different from a corresponding dimension of the respective ones of the contone image blocks.

Claim 6 (previously presented): The method of claim 1, wherein the sequence of graphical code word symbols corresponds to a graphical bar code.

Claim 7 (previously presented): The method of claim 1, wherein the producing comprises

halftoning the contone image blocks, and

determining whether to derive ones of the output halftone image blocks from either respective ones of the contone image blocks or respective ones of the graphical code word symbols based on image intensity levels in the respective ones of the contone image blocks.

Claim 8 (previously presented): The method of claim 7, wherein the halftoning comprises error diffusion halftoning the contone image blocks.

Claim 9 (previously presented): The method of claim 1, further comprising diffusing error values determined from the output halftone image blocks.

Claim 10 (original): Apparatus for performing the method of claim 1.

Claim 11 (original): An article comprising memory encoded with a program for causing a processor to perform the method of claim 1.

Claim 12 (original): A method of extracting information embedded in a halftone image, the method comprising:

accessing a bi-level bit map;

partitioning the halftone image into a plurality of image blocks;

using the bitmap to select at least some of the blocks;

identifying a code word sequence in the selected blocks; and

extracting the information from the code word sequence.

Claim 13 (previously presented): The method of claim 12, wherein the using comprises selecting ones of the image blocks at a rate that is linked to a graylevel of the halftone image.

Claim 14 (previously presented): The method of claim 12, wherein the accessing comprises selecting the bitmap from a table of different bi-level bitmaps.

Claim 15 (previously presented): The method of claim 14, wherein the accessing comprises using a gray level value as an index into the table of the different bi-level bitmaps.

Claim 16 (previously presented): The method of claim 12, wherein the using comprises determining which of the image blocks to select based on image intensity levels of the image blocks.

Claim 17 (previously presented): The method of claim 12, further comprising using unselected ones of the image blocks to construct a version of the halftone image free of the embedded information.

Claim 18 (previously presented): The method of claim 12, wherein the extracting comprises using probabilistic analysis to produce a set of probability parameters, using the set of probability parameters to select a likely sequence of graphical code word symbols encoded into the halftone image, and converting the selected sequence of graphical code word symbols into the extracted information.

Claim 19 (original): Apparatus for performing the method of claim 12.

Claim 20 (original): An article comprising memory encoded with a data for causing a processor to perform the method of claim 12.

Claim 21 (previously presented): Apparatus comprising one of an encoder for encoding a contone image and a decoder for decoding a halftone image;

the encoder being operable to perform operations comprising

determining a first bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value,

partitioning the contone image into an array of contone image blocks,

generating a first sequence of graphical code word symbols encoding information, and

producing blocks of an output halftone image from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective ones of the bits of the bi-level bitmap, wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols; and

the decoder being operable to perform operations comprising

determining a second bi-level bit map of bits from a graylevel value, wherein each of the bits of the second bi-level bit map has a respective one of two different values,

partitioning a version of the output halftone image into a plurality of partitioned halftone image blocks,

selecting ones of the partitioned halftone image blocks in accordance with the values of respective ones of the bits of the second bitmap,

identifying a second sequence of graphical code word symbols from the selected ones of the partitioned halftone image blocks, and

extracting information from the second sequence of graphical code word symbols.

Claim 22 (previously presented): The apparatus of claim 21, wherein the encoder determines the fist bi-level bitmap based on the graylevel value characterizing the first bi-level bitmap.

Claim 23 (previously presented): The apparatus of claim 22, wherein the encoder produces the bitmap by halftoning a contone patch of the graylevel value characterizing the first bi-level bitmap.

Claim 24 (previously presented): The apparatus claim 21, wherein the encoder produces the output halftone image blocks with a dimension that is different from a corresponding dimension of the respective ones of the contone image blocks.

Claim 25 (previously presented): The apparatus of claim 21, wherein the first sequence of graphical code word symbols corresponds to a graphical bar code.

Claim 26 (previously presented): The apparatus of claim 21, wherein in producing blocks of an output halftone image the encoder performs operations comprising

halftoning the contone image blocks, and

determining whether to derive ones of the output halftone image blocks from either respective ones of the contone image blocks or respective ones of the graphical code word symbols based on image intensity levels in the respective ones of the contone image blocks.

Claim 27 (previously presented): The apparatus of claim 21, wherein the decoder selects ones of the partitioned halftone image blocks at a rate that is linked to a graylevel of the version of the output halftone image.

Claim 28 (previously presented): The apparatus of claim 27, wherein in extracting the information the decoder uses probabilistic analysis to produce a set of probability parameters, uses the set of probability parameters to select a likely sequence of graphical code word symbols encoded into the output halftone image, and converting the selected sequence of graphical code word symbols into the extracted information.

Claim 29 (previously presented): A computer-readable medium storing computer-readable instructions for causing a computer to perform operations comprising:

determining a bi-level bitmap of bits from a graylevel value, wherein each of the bits has a respective one of either a first value or a second value;

partitioning the contone image into an array of contone image blocks;

generating a sequence of graphical code word symbols encoding information; and

producing blocks of an output halftone image from ones of the contone image blocks and ones of the graphical code word symbols in accordance with the values of respective

ones of the bits of the bi-level bitmap, wherein ones of the output halftone image blocks associated with respective ones of the bits having the first value are derived from respective ones of the contone image blocks and ones of the output halftone image blocks associated with respective ones of the bits having the second value are derived from respective ones of the graphical code word symbols.

Claim 30 (previously presented): The computer-readable medium of claim 29, wherein the computer-readable instructions cause the computer to perform operations comprising determining the bitmap based on the graylevel value.

Claim 31 (previously presented): The computer-readable medium of claim 30, wherein the computer-readable instructions cause the computer to perform operations comprising producing the bitmap by halftoning a contone patch of the graylevel value .

Claim 32 (previously presented): The computer-readable medium of claim 29, wherein the computer-readable instructions cause the computer to perform operations comprising producing the output halftone image blocks with a dimension that is different from a corresponding dimension of the respective ones of the contone image blocks .

Claim 33 (previously presented): The computer-readable medium of claim 29, wherein the sequence of graphical code word symbols corresponds to a graphical bar code.

Claim 34 (previously presented): The computer-readable medium of claim 29, wherein the computer-readable instructions cause the computer to perform operations comprising

halftoning the contone image blocks, and

determining whether to derive ones of the output halftone image blocks from either respective ones of the contone image blocks or respective ones of the graphical code word symbols based on image intensity levels in the respective ones of the contone image blocks.

Claim 35 (previously presented): A computer-readable medium storing computer-readable instructions for causing a computer to perform operations comprising:

determining a bi-level bit map of bits from a graylevel value, wherein each of the bits has a respective one of two different values;

partitioning a halftone image into a plurality of partitioned halftone image blocks;

selecting ones of the partitioned halftone image blocks in accordance with the values of respective ones of the bits of the bitmap;

identifying a sequence of graphical code word symbols from the selected ones of the partitioned halftone image blocks; and

extracting information from the sequence of graphical code word symbols.

Claim 36 (previously presented): The computer-readable medium of claim 35, wherein the computer-readable instructions cause the computer to perform operations comprising determining the bitmap based on the graylevel value characterizing the bi-level bitmap.

Claim 37 (previously presented): The computer-readable medium of claim 35, wherein the computer-readable instructions cause the computer to perform operations comprising determining which of the image blocks to select based on image intensity levels of the image blocks.

Claim 38 (previously presented): The computer-readable medium of claim 35, wherein the computer-readable instructions cause the computer to perform operations comprising using probabilistic analysis to produce a set of probability parameters, using the set of probability parameters to select a likely sequence of graphical code word symbols encoded into the halftone image, and converting the selected sequence of graphical code word symbols into the extracted information.

## EVIDENCE APPENDIX

There is no evidence submitted pursuant to 37 CFR §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellant in the pending appeal. Therefore, no copies are required under 37 CFR § 41.37(c)(1)(ix) in the pending appeal.

## RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any decisions rendered by a court or the Board that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal. Therefore, no copies are required under 37 CFR § 41.37(c)(1)(x) in the pending appeal.